

17-NOV-09
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GEORGIA DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM
REVISED: JUNE 30, 2008
36' CURB-CURB; 5 BEAMS; 140' SPAN; 40' TALL; BRIDGE 18A ; PIER 2,3

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP				
OPTIONS											EC	ES	STRAIN	FACT	MAIN SIZE	STR SIZE	MAX TOP	MAX BOT	MIN TOP	MIN BOT	NO.	CL.	S.SP INCR.	CL.
D D D L	2	1	12	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00

COLUMN MIN.	REINFORCING MAX.	STEEL CL.SP.	R CLEAR	KL MODE	OC COEF	OF	CM	BD1	BD2	IMPACT %	SOIL KCF	WT KSF	ALL.S.P.	MIN PL	MAX SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE INCR.	PILE CL.
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999		

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.000	8.000	4.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		40.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND INTENSITIES

WIND TRANS.	FT1	FT2	FT3	FT4	FT5	WIND APT	ARM APL	WIND ON PIER PT								
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	14.323

GROUP III WIND INTENSITIES

STD. WIND FT1	WIND ON SUPERSTRUCTURE FT1	INTENSITIES FT2	STD. WIND FT3	WIND ON SUPERSTRUCTURE FT3	INTENSITIES FT4	STD. WIND FT5	WIND ON SUPERSTRUCTURE FT5	INTENSITIES FT6	STD. WIND FT7	WIND ON SUPERSTRUCTURE FT7	INTENSITIES FT8	STD. WIND FT9	WIND ON SUPERSTRUCTURE FT9	INTENSITIES FT10	STD. WIND FT11	WIND ON SUPERSTRUCTURE FT11	INTENSITIES FT12	STD. WIND FT13	WIND ON SUPERSTRUCTURE FT13	INTENSITIES FT14	STD. WIND FT15	WIND ON SUPERSTRUCTURE FT15	INTENSITIES FT16	STD. WIND FT17	WIND ON SUPERSTRUCTURE FT17	INTENSITIES FT18	STD. WIND FT19	WIND ON SUPERSTRUCTURE FT19	INTENSITIES FT20	STD. WIND FT21	WIND ON SUPERSTRUCTURE FT21	INTENSITIES FT22	STD. WIND FT23	WIND ON SUPERSTRUCTURE FT23	INTENSITIES FT24	STD. WIND FT25	WIND ON SUPERSTRUCTURE FT25	INTENSITIES FT26	STD. WIND FT27	WIND ON SUPERSTRUCTURE FT27	INTENSITIES FT28	STD. WIND FT29	WIND ON SUPERSTRUCTURE FT29	INTENSITIES FT30	STD. WIND FT31	WIND ON SUPERSTRUCTURE FT31	INTENSITIES FT32	STD. WIND FT33	WIND ON SUPERSTRUCTURE FT33	INTENSITIES FT34	STD. WIND FT35	WIND ON SUPERSTRUCTURE FT35	INTENSITIES FT36	STD. WIND FT37	WIND ON SUPERSTRUCTURE FT37	INTENSITIES FT38	STD. WIND FT39	WIND ON SUPERSTRUCTURE FT39	INTENSITIES FT40	STD. WIND FT41	WIND ON SUPERSTRUCTURE FT41	INTENSITIES FT42	STD. WIND FT43	WIND ON SUPERSTRUCTURE FT43	INTENSITIES FT44	STD. WIND FT45	WIND ON SUPERSTRUCTURE FT45	INTENSITIES FT46	STD. WIND FT47	WIND ON SUPERSTRUCTURE FT47	INTENSITIES FT48	STD. WIND FT49	WIND ON SUPERSTRUCTURE FT49	INTENSITIES FT50	STD. WIND FT51	WIND ON SUPERSTRUCTURE FT51	INTENSITIES FT52	STD. WIND FT53	WIND ON SUPERSTRUCTURE FT53	INTENSITIES FT54	STD. WIND FT55	WIND ON SUPERSTRUCTURE FT55	INTENSITIES FT56	STD. WIND FT57	WIND ON SUPERSTRUCTURE FT57	INTENSITIES FT58	STD. WIND FT59	WIND ON SUPERSTRUCTURE FT59	INTENSITIES FT60	STD. WIND FT61	WIND ON SUPERSTRUCTURE FT61	INTENSITIES FT62	STD. WIND FT63	WIND ON SUPERSTRUCTURE FT63	INTENSITIES FT64	STD. WIND FT65	WIND ON SUPERSTRUCTURE FT65	INTENSITIES FT66	STD. WIND FT67	WIND ON SUPERSTRUCTURE FT67	INTENSITIES FT68	STD. WIND FT69	WIND ON SUPERSTRUCTURE FT69	INTENSITIES FT70	STD. WIND FT71	WIND ON SUPERSTRUCTURE FT71	INTENSITIES FT72	STD. WIND FT73	WIND ON SUPERSTRUCTURE FT73	INTENSITIES FT74	STD. WIND FT75	WIND ON SUPERSTRUCTURE FT75	INTENSITIES FT76	STD. WIND FT77	WIND ON SUPERSTRUCTURE FT77	INTENSITIES FT78	STD. WIND FT79	WIND ON SUPERSTRUCTURE FT79	INTENSITIES FT80	STD. WIND FT81	WIND ON SUPERSTRUCTURE FT81	INTENSITIES FT82	STD. WIND FT83	WIND ON SUPERSTRUCTURE FT83	INTENSITIES FT84	STD. WIND FT85	WIND ON SUPERSTRUCTURE FT85	INTENSITIES FT86	STD. WIND FT87	WIND ON SUPERSTRUCTURE FT87	INTENSITIES FT88	STD. WIND FT89	WIND ON SUPERSTRUCTURE FT89	INTENSITIES FT90	STD. WIND FT91	WIND ON SUPERSTRUCTURE FT91	INTENSITIES FT92	STD. WIND FT93	WIND ON SUPERSTRUCTURE FT93	INTENSITIES FT94	STD. WIND FT95	WIND ON SUPERSTRUCTURE FT95	INTENSITIES FT96	STD. WIND FT97	WIND ON SUPERSTRUCTURE FT97	INTENSITIES FT98	STD. WIND FT99	WIND ON SUPERSTRUCTURE FT99	INTENSITIES FT100
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583																																																																																																																												

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
2.670	9.860	15.583	15.583	0.00018000	0.00044000	0.000	0.000

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	281.621	325.334	0.000	325.334	0.000	325.334	281.621					
LL 1	1	85.882	51.529	0.000	0.000	0.000	0.000	0.000					
LL 2	2	85.882	103.059	0.000	85.882	0.000	0.000	0.000					
LL 3	3	85.882	103.059	0.000	120.235	0.000	85.882	17.176					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.529	85.882					
LL 5	2	0.000	0.000	0.000	85.882	0.000	103.059	85.882					
LL 6	3	17.176	85.882	0.000	120.235	0.000	103.059	85.882					
LL 7	1	0.000	25.764	0.000	85.882	0.000	25.764	0.000					
LL 8	2	42.941	111.647	0.000	94.470	0.000	25.764	0.000					
LL 9	3	42.941	111.647	0.000	103.059	0.000	111.647	42.941					
LL10	2	0.000	85.882	0.000	103.059	0.000	85.882	0.000					
LL11	2	85.882	51.529	0.000	0.000	0.000	51.529	85.882					
LL12	3	85.882	103.059	0.000	85.882	0.000	51.529	85.882					

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

*

LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	40.000	0.000	0.000	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	1765.594 2010.394	0.000	0.000	0.000	2010.394	8089.646	-8089.646	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-212.808	-9.860	-548.048	-548.048
CENT. FORCE 1 LN	1	0.000	-57.627	2.670	148.407	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 1	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	85.938	14.323	572.920	572.920
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	-305.021	-30.703	-1348.923	-1348.923

PIER-36-5-140-40.OUT																
GROUP	WIND	2	2	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	305.021	30.703	1348.923	1348.923	
GROUP 2	WIND	3	1	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	-524.103	-47.083	-2124.925	-2124.925	
GROUP 2	WIND	3	2	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	524.103	47.083	2124.925	2124.925	
GROUP 2	WIND	4	1	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	-670.158	-58.003	-2642.260	-2642.260	
GROUP 2	WIND	4	2	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	670.158	58.003	2642.260	2642.260	
GROUP 2	WIND	5	1	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	-779.699	-66.193	-3030.261	-3030.261	
GROUP 2	WIND	5	2	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	779.699	66.193	3030.261	3030.261	
GROUP 3	WIND	1	1	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876	
GROUP 3	WIND	1	2	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	25.781	4.297	171.876	171.876	
GROUP 3	WIND	2	1	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	-164.025	-12.571	-591.436	-591.436	
GROUP 3	WIND	2	2	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	164.025	12.571	591.436	591.436	
GROUP 3	WIND	3	1	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	-302.269	-20.845	-1010.995	-1010.995	
GROUP 3	WIND	3	2	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	302.269	20.845	1010.995	1010.995	
GROUP 3	WIND	4	1	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	-394.431	-26.361	-1290.702	-1290.702	
GROUP 3	WIND	4	2	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	394.431	26.361	1290.702	1290.702	
GROUP 3	WIND	5	1	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	-463.553	-30.498	-1500.481	-1500.481	
GROUP 3	WIND	5	2	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	463.553	30.498	1500.481	1500.481	
LIVE LOAD	LL	1	1	1	137.411	-1786.344	0.000	1786.344	137.411	1786.344	0.000	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE								LONGITUDINAL					
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF			
LIVE LOAD	LL 2	1	274.823	-2198.584	0.000	2198.584	274.823	2198.584	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 3	1	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 4	1	137.411	1786.344	0.000	-1786.344	137.411	0.000	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 5	1	274.823	2198.584	0.000	-2198.584	274.823	0.000	-2198.584	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 6	1	371.011	1113.041	0.000	-1113.041	371.011	865.685	-1978.726	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 7	1	137.410	0.000	0.000	0.000	137.410	206.112	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 8	1	274.822	-1374.120	0.000	1374.120	274.822	1580.232	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 9	1	371.011	0.000	0.000	0.000	371.011	1422.209	-1422.209	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL10	1	274.823	0.000	0.000	0.000	274.823	687.056	-687.056	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL11	1	274.822	0.000	0.000	0.000	274.822	1786.344	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL12	1	371.011	-371.016	0.000	371.016	371.011	1978.726	-1607.710	0.000	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	MOMENTS(KIP-FEET)								SHEARS(KIPS)							
	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT			
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-385.040	-18.933	-385.040	-18.933	-571.490			
P 2	-3323.512	-3323.512	-4815.111	-3323.512	-3323.512	-3323.512	-4216.685	-440.751	-863.685	-440.751	-863.685	-627.201	-1273.876			
P 3	-6846.743	-6846.743	-9979.105	-6846.743	-6846.743	-6846.743	-8722.409	-898.729	-898.729	-898.729	-898.729	-1308.920	-1308.920			
C 1L	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699	-936.169		-936.169		-1346.360				
C 1R	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699		936.169		1346.360		936.169			
P 5	-6846.743	-6846.743	-9979.104	-6846.743	-6846.743	-6846.743	-8722.409	898.729	898.729	1308.920	1308.920	898.729	898.729			
P 6	-3323.512	-3323.512	-4815.110	-3323.512	-3323.512	-3323.512	-4216.685	863.685	440.751	1273.876	627.201	863.685	440.751			
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	385.040	18.933	571.490	18.933	385.040	18.933			

PT.	UNF. K-FT.		TOP REINFORCE. AS NO. SIZE		BOT. REINFORCE. AS NO. SIZE		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
	M+	M-	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	LEFT STIRRUPS BAR&SPAC	RIGHT STIRRUPS BAR&SPAC						
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14	0.08	0.000	0.099
P 2	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.169D#5@ 7.35	83.71	0.25	0.563	1.210	
P 3	-5266.726	-6709.546	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
C 1	-8089.646	-10288.230	38.97	25 # 11	3.12	2 # 11	24.00	0.145	#5@ 4.29	24.00	0.145	#5@ 4.29	96.00	0.63	0.593	0.977
P 5	-5266.726	-6709.545	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
P 6	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.169D#5@ 7.35	24.00	0.060	#5@10.33	83.71	0.25	0.563	1.210	
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14	0.08	0.000	0.099

NOTE: *** FS/FZ RATIO EXCEEDS 1.0! ***

PIER-36-5-140-40.OUT

CRITICAL COLUMN LOADS

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL 2	0.0			C		2891.9	-4923.0	0.0	2891.9	5412.1	2041.3	8493.7	15899.0	5996.7	2.938	72.00	96.00
1	B		3	LL 2	4.1			C		2970.8	4826.2	-3102.8	2970.8	5264.7	3600.5	7376.9	13040.6	8918.4	2.478	72.00	96.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	3051.	33756.	1.099	1.176	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2812.	33756.	1.091	1.160	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 2	3.1		C		2241.590	3643.155	35.191-2107.092	-40.565	142.729	54.666	204.726	292.789	132.096	-0.030	46.595		MAX.P1
1	3	LL 2	1.1		C		2914.067	5145.172	53.816-1648.364	-31.222	153.918	85.115	297.774	366.576	176.575	-0.040	60.573		MAX.MT
1	3	LL 2	3.1		C		2914.067	4736.101	45.749-2739.219	-52.734	185.548	71.066	266.144	380.625	171.725	-0.040	60.573		MAX.VT
1	3	LL 3	3.1		C		3019.261	3683.967	48.179-3237.943	-61.707	223.979	88.762	242.740	377.957	164.533	-0.040	62.699		MAX.VP
1	3	LL 3	5.1		C		3019.261	2593.112	26.666-3874.275	-74.256	260.743	98.880	205.976	367.839	248.656	23.078	62.699		MAX.ML
1	3	LL 3	5.1		C		3019.261	2593.112	26.666-3874.275	-74.256	260.743	98.880	205.976	367.839	248.656	23.078	62.699		MAX.VL
1	3	LL 2	3.1		C		2241.590	3643.155	35.191-2107.092	-40.565	142.729	54.666	204.726	292.789	132.096	-0.030	46.595		MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE			* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
14.500	14.500	4.500	0.997	1.08	20 # 8	@ 8.625	TOP TRAN	178.065	44.932	89.864	37.230	0.000
				1.49	17 #10	@10.125	BOT.LONG	248.675	46.302	92.604	38.365	0.000

NUMBER OF PILES = 14 BP = 2.000 DP = 2.000